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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/693,283	10/24/2003	Nozomu Matsukawa	10873.1179USW1	4128

23552 7590 06/03/2005

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EXAMINER	
PADGETT, MARIANNE L	
ART UNIT	**PAPER NUMBER**
1762	

DATE MAILED: 06/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/693,283	MATSUKAWA ET AL.	
	Examiner	Art Unit	
	Marianne L. Padgett	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 2/16/05 & 3/1/05.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 12-15 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 12-15 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

1. Applicants' submission of a certified translation of their priority document JP 2001-19217 A on 2/16/05 is noted and it removes the rejections abased on Fukuzawa et al (2002/0048127 A1) with filing date 9/4/2001, by perfecting the priority date, so that any reference having a date of 6/26/01 or later is not prior art for features of claims 12 and 14. It is noted that in the 102 page document, while no heat treatment range of the entire multilayer film at "330°C or more" was found, values bracketing the end point value were found ([0008] 300°C or 350°C; [0028] ≥300°C; [0038] 260, 300, 350 and 400°C), hence the presently claimed range is considered adequately supported in the priority document.

With respect to claim 13, the only range of values for angle of incident for the ion beam was found in [0038] and was 10° – 15°, hence the entire range of this claim was NOT found to be supported by the JP priority document.

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 2 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Skinner et al (2002/0068132 A1), optionally considering Takagi et al (4,395,465) or Kawawake et al (6,535,362 B2), further in view of Kawawake et al (6,245,450 B1) or Nishioka et al (5,648,885).

First with respect to necessary meanings of the claim language, it is noted that lacking temporal language or clear antecedent, the order of listing steps does not necessitated any order of doing. Therefore, the 2 listed heat treating steps as previously noted (section 4 of the 11/17/04 action) may both be the same step, since when the substrate and multilayer film is heated, so is the underlying film, with 400°C or more encompassed by 330°C or more. Alternately, the "heat-treating the underlying..." limitation can coincide with the ion beam irradiation, as there is no necessary order and as it is old and well known that such irradiation causes heating.

Skinner et al teach the formation of (giant) magnetoresistive (MR or GMR) elements as claimed, noting that the 2 ferromagnetic films separated by a non-magnetic layer is the most elementary design, with further discussion on the orienting effect of magnetic fields with their effect on resistively ([0004-5] and [0028-29]). Note fig. 1, ref #124, 118 and 122 provide for various electrode related structures. Skinner et al further discuss the benefits of smoothness in GMR devices ([0009] and [0030]), teaching a gas cluster ion beam (GCIB) process that is superior to previously used polishing techniques. Skinner et al teach that roughness from proceeding films in the stack of films can have a cumulative effect and can contribute to lack of sensitivity in the GMR device. At the end of paragraph [0030], it is specifically taught that it is

sometimes necessary to smooth layer deposited prior to the actual fabrication of the GMR device, with exemplary reference to layers 102, 104 and 106 (fig. 1) cumulatively affecting it. The GCIB and its smoothing effects are discussed in [0031-38], with fig. 3-5 and 10 being relevant. Skinner et al also exemplifies this ion beam process as applied to permalloy films which may be NiFe and illustrated layers 104, 110, 114, 116, 122, of which 104 is an underlying layer as claimed [0046-47, 49].

Skinner et al differs from applicants' claims by not discussing any heating process, however if the first listed "heat-treating..." is taken as before the "forming..." limitation (possible, but not necessitated), then inherent heating during the GCIB process may be considered to read on this process, where Takagi et al (465) may optionally be considered for showing the self-heating effects of ionized cluster beams (col. 2, lines 58-68^{+}) with col. 4, lines 55-68 and col. 5, lines 24-33 noting that angle of incident (oblique impingement) effects improvements in magnetic properties (coercivity) and grain structure. Alternately, Kawawake et al (362), discussed in section 5 of the 11/17/04 action teaches MR devices consistent with those treated in Skinner et al, where heating is applied for smoothing, such that its effects would have been considered cumulative to those of the ion irradiation. As noted previously, choice of a heat-treating temperature would have been dependent on particular material heated, as well as desired effect, neither of which are specified by the claim, such that heating of an unknown material for an unknown purpose at 400°C to infinity has little significance in and of its self. However, with respect to Skimmer et al's process considering inherent GCIB heating effects, the temperature achieved thereby would have been dependent on the ions kinetic energy, dose, etc., with expectations that localized heating of the treated layer would include claimed temperatures

depending on other temperature controlling conditions, particular materials to be treated and their tolerances, which would have been determined by routine experimentation. Kawawake et al (362) makes heating of pre-GMR device layers obvious for reason analogous to those discussed in section 5 of the 11/17/04 mailing, with like reasons for obviousness of claimed temperatures.

While Skinner et al does not discuss any post deposition heating or annealing steps, the focus of their teachings are on the GCIB smoothing process, and they refer the reader to other exemplary patents with structures related to their teachings and consider many possible arrangements and procedures are applicable to or with their technique [0029]. Nishioka et al cited by Skinner, teach a GMR device where annealing of the multilayer sensor in a magnetic field at exemplary temperatures of 80, 100, 140, 160, 200 and 250°C to effect magnetic properties are taught (abstract; col. 10, lines 42-col. 11, lines 35), with teaching of choosing a proper annealing temperature based on the temperature and time dependency of the anisotropy field and pinning field of the material. Alternately, Kawawake et al (450) also teach an analogous structure (col. 4, lines 1-21), discuss heat-treating of MR layer from 150-350°C to effect the magnetic direction, with specific examples of whole device treatment at 270°C (col. 2, lines 45-50; col. 3, lines 23-26; col. 6, lines 61-col 7, lines 3 for MR devices with greater pinning field after device production or heat treatment; Ex. 2, col. 14, line 31; claims 8 and 16). Given Skinner et al's [0029] teachings, and either the teaching of Nishioka et al or Kawawake et al (450), it would have been obvious to one of ordinary skill in the art the post multilayer film deposition heating treatment to optimize magnetic properties was a desirable procedure, where one would have been expected to choose temperatures based on properties of specific layer

composition in the device, noting that Kawawake et al (450) specifically includes heat treatment values within the claimed range.

4. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Skinner et al, optionally in view of Kawawake et al (362) or Takagi et al, and in view of Kawawake et al (450) or Nishioka et al applied to claims 12 and 14 above, and further in view of Takagi et al, introduced and discussed above.

Skinner et al has no teachings on the angle at which their ion beam is applied, however Takagi et al note the desirable effect that ionized cluster beam's angle of incident has on magnetic and grain structure properties, hence it would have been obvious to one of ordinary skill to optimize the GCIB angle of incidence to effect the morphologic structure as taught and where the treated underlaying layer is a permalloy, to optimize its desired magnetic properties. Note as the layer applicants' ion beam is being applied to is of unspecified materials, the angle of incident has no clear effect or purpose in the context of the present claims.

5. Applicant's arguments with respect to claims 12-14 are have been considered but are moot in view of the new ground(s) of rejection.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to M L. Padgett whose telephone number is (571) 272-1425. The examiner can normally be reached on Monday-Friday from about 8:30 am to 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached at (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

M. L. Padgett/af
May 12, 2005
June 1, 2005

MARIANNE PADGETT
PRIMARY EXAMINER